



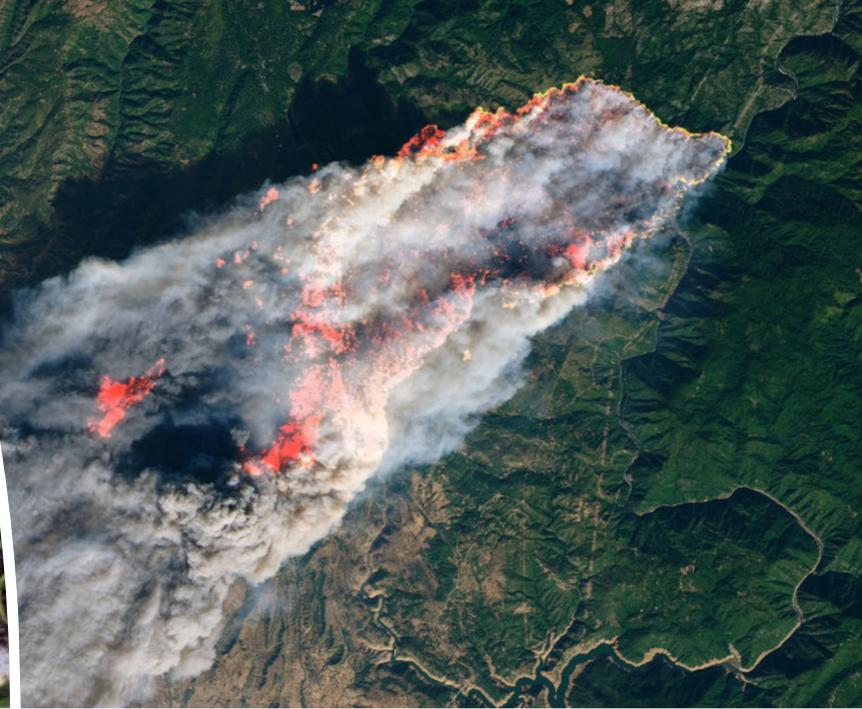
# **STREAM: SATELLITE-BASED ANALYSIS TOOL FOR RAPID EVALUATION OF AQUATIC ENVIRONMENTS**

**NIMA PAHLEVAN, NAVID GOLPAYEGANI, ASEN RADOV, AKASH ASHAPURE  
RYAN O'SHEA, ARUN SARANATHAN, BRANDON SMITH, SAKIB KABIR**

**CODE 619/ TERRESTRIAL INFORMATION SYSTEMS LAB  
SSAI / FRESHWATER SENSING GROUP**

**LANCE UWG  
4 MAY 2022**

# “What’s Water Worth? It Is Priceless and Essential to Survival”



- **Water Resources are Under Threat**

- Wildfires, Flooding
- Food Production, Mining, Recreation

- **Impacts**

- Water Pollution
- Harmful Algal Blooms (HABs)

- **Consequences & Implications**

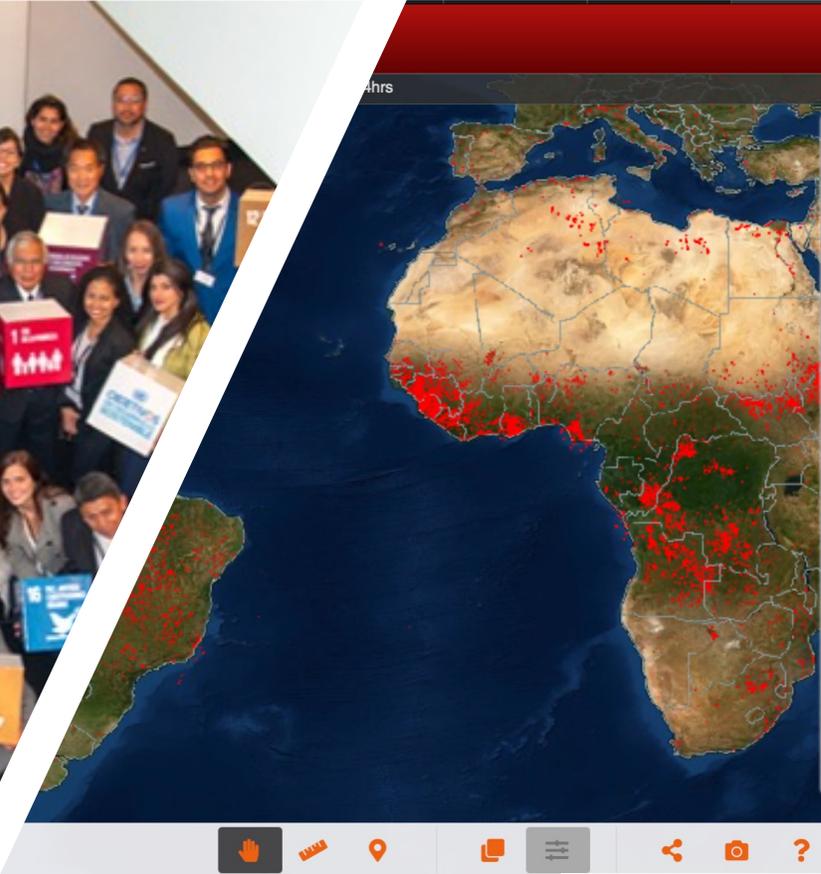
- Public Health
- Economy





# STREAM: Its Inception and Evolution

- **NASA's water quality workshop in 2017**
- **Supported by HQ Applied Sciences**
- **Improve water-quality monitoring**
  - Near-real time
  - Visualization and analysis (SDG 6)
  - Built on FIRMS
- **Aquatic ecosystems > 150 m wide**
  - Complement CyAN
- **Engage and interact with end-users and UN Environment Program (UNEP)**





# Decision-making Process

1. Identify hotspots
2. Action
  - Conduct field surveys
3. Decision-making
  - Shut off drinking water intakes
  - Advisories

SATELLITE | IN SITU

2021-01-20

River

Site: Rio Negro

Chlorophyll-a [mg/m<sup>3</sup>]

Range: 0 – 20

**TOXIC ALGAE PRESENT**  
Lake is CLOSED

Until further notice:

- DO NOT swim or recreate in water
- DO NOT water ski, jet ski, or paddle board
- DO NOT drink water
- Keep all pets, livestock, and horses away from water
- Fishing not advised
- Boating not advised

Call your doctor or veterinarian immediately if you or your animals have sudden or unexplained sickness or signs of poisoning

Report new algae blooms to: [hab.mt.gov](http://hab.mt.gov) or 1-888-849-2938

Sign posted by:

**WARNING**

**HARMFUL ALGAE PRESENT**

PEOPLE AND ANIMALS SHOULD AVOID SWIMMING AND WADING UNTIL FURTHER NOTICE

**EXPOSURE TO ALGAL TOXINS MAY CAUSE ILLNESS**

Call your doctor or veterinarian if you or your animals have sudden or unexplained sickness or signs of poisoning.

While fish consumption is not affected by toxic algae, thoroughly cleaning the fish, discarding the carcass & guts, & washing hands & surfaces afterward with soapy water is advised.

Report suspected Harmful Algae Bloom-related illnesses to the HAB hotline at: 888-238-6154

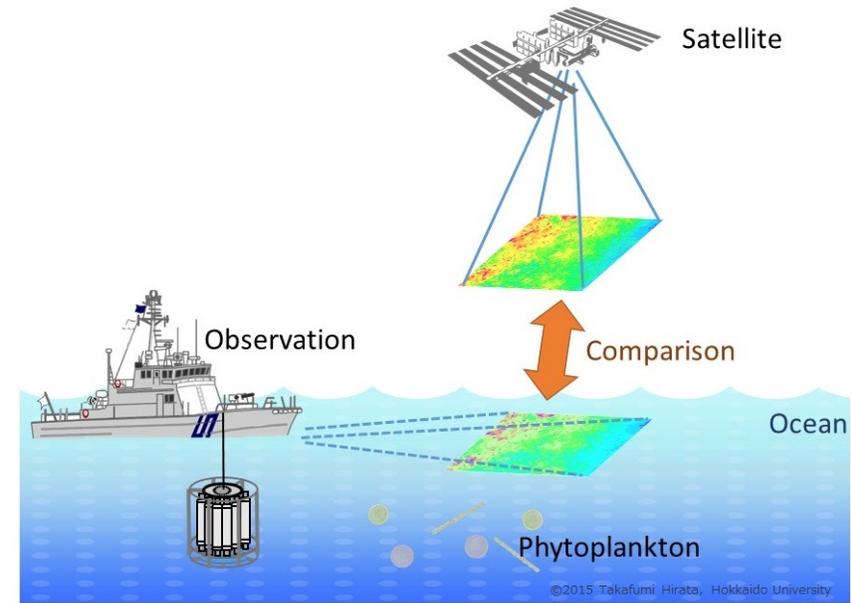
50 km

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# Workflow



- Level-1:
  - Data: Landsat-8/9 and Sentinel-2A/B (~ 3-day revisit rate, 3-6 hr latency)
  - Source: USGS Earth Explorer & Sentinel Hub
- Level-2:
  - SeaWiFS Data Analysis System (SeaDAS) to generate reflectance
  - In-house ML models to generate water-quality products
  - Rigorously validate products. Engage with countries for validation.
- Backend
  - Python codes run on Lab's HPC, MapServer
- Frontend
  - OpenLayers



# Functionalities

- NRT image processing
- Products: chlorophyll-a, Total Suspended Solids (TSS), and RGBs
- Downloadable maps (Geotiff)
- Visualization
- Time-series analysis (daily/weekly/monthly)
  - Per-pixel queries
  - Lake-wide (area-based) queries
- Notification system
- End-users:
  - Accessible to Water Authority of Peru and Uruguay via EarthData
  - SDG 6.3.2 reporting

STREAM  
Satellite-based analysis Tool for Rapid Evaluation of Aquatic environments

Lat: 37.698°, Lon: -121.895°

SATELLITE IN SITU

2020-04-03

Bay

Site: San Francisco

TSS [g/m<sup>3</sup>]

Range: 0 – 20

0 4 8 12 16 20

Orbit Tracks

Daily Weekly Monthly

Chlorophyll-a [mg/m<sup>3</sup>]

30  
25  
20  
15  
10  
5  
0

2018-06-09 2018-06-14 2018-06-21 2018-06-28 2018-07-07 2018-07-14 2018-07-21 2018-07-28 2018-08-08 2018-08-15 2018-08-22 2018-08-29 2018-09-07 2018-09-14 2018-09-21 2018-09-28 2019-10-06 2019-10-13 2019-10-20 2019-10-27 2020-01-04 2020-01-11 2020-01-18 2020-01-25

Download chart data

STREAM  
Satellite-based analysis Tool for Rapid Evaluation of Aquatic environments

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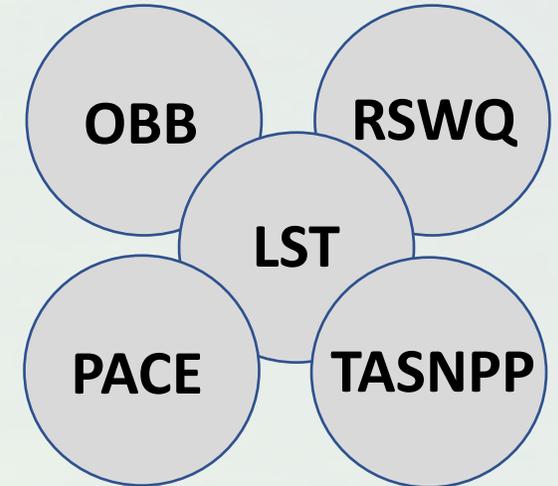
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# Next Steps

- Science algorithm maintenance/evolution
  - Atmospheric correction
  - Other products
  - Uncertainty reporting
  - Validation
- Transition the backend to MODAPS or Cloud
- Maintain/update frontend
- Opportunities
  - Improved timeliness
  - Forecasting capabilities





Questions?

